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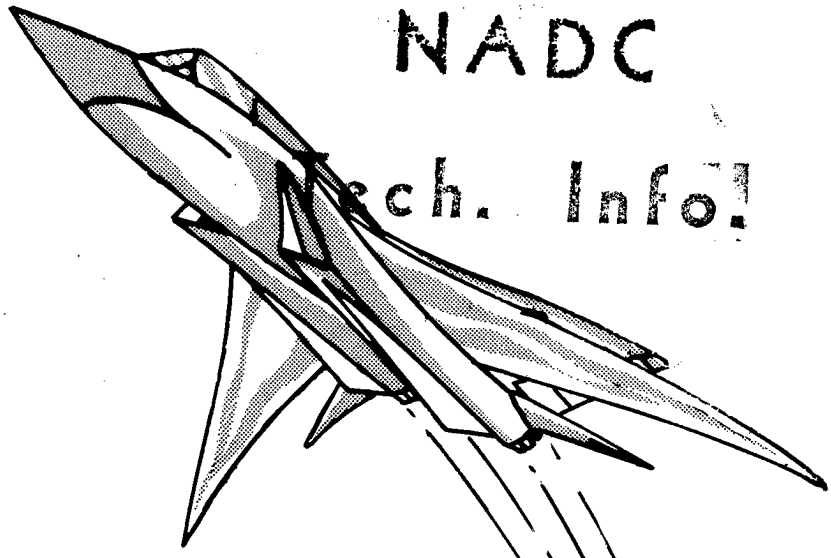


AVIONICS READINESS PROGRAM FOR 1980-2000

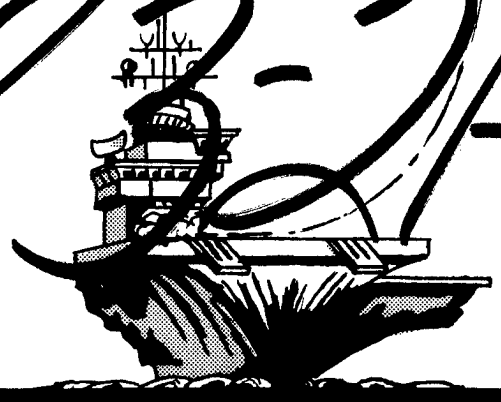
DEVELOPED FOR
NAVAL AIR SYSTEMS COMMAND
BY NAVAL AIR DEVELOPMENT CENTER

IMPLEMENTATION PLAN

VOLUME II C

WORK UNIT SUMMARIES

2 JUNE 75



Naval Air Development Center
Warminster, Pennsylvania 18974

ABSTRACT

Volume IIC of the ARP Implementation Plan contains the Work Unit Summary proposals for each task identified in Volume IIB. These proposals are for NAVAIRSYSCOM consideration in the origination and assignment of Airtasks to the field activities for prosecution of individual or groups of ARP tasks.

Volume IIC

Table of Contents

SECTION 1.0

TECHNOLOGY ASSESSMENT

Section 1.0 - Technology Assessment

A. Airtask No.:

B. NAVAIRSYSCOM Activity: AIR-340E

C. Task Title: Basic Elements

D. Task No.: 1.1

E. Task Classification: Unclassified

F. Funding Category: 6.2

G. Funding Requirements:

FY-76	FY-7T	FY-77	FY-78	FY-79	FY-80
16K	14K	54K	0	0	0

H. Field Activity:

Principal Investigator:

Associate Investigator:

I. Summary:

The results of the efforts conducted under the subtasks associated with basic elements will be integrated and correlated. Matrices will be developed which will indicate the best mixture of the various elements (i.e., hardware, software, packaging) with respect to generic circuit functions (i.e., high power, low power, displays that may normally be specified and procured independent from a particular weapons system application and packaged as SRA's, processing, etc.). Applications of these functions will be recommended. The results of this effort will provide the bases for additional tasks planned in the application of readiness parameters in the design of avionic systems and subsystems.

J. Major Contracts: None

Section 1.0 - Technology Assessment

A. Airtask No.:

B. NAVAIRSYSCOM Activity: AIR-340E

C. Task Title: Basic Elements, Analog Hardware Testability

D. Task No.: 1.1.1

E. Task Classification: Unclassified

F. Funding Category: 6.2

G. Funding Requirements:

FY-76	FY-7T	FY-77	FY-78	FY-79	FY-80
214K	65K	185K	0	0	0

H. Field Activity:
Principal Investigator:
Associate Investigator:

I. Summary:

The task is to improve testability of analog hardware. Several approaches will be pursued. Digital circuitry design and test design techniques will be investigated to provide new guidelines for the enhancement of and implementation of digital circuitry to historically analog functions.

The development of an analog functional and interface simulation program will be pursued to provide for a measurement of design performance and supportability parameters. In addition, this program will measure contractual suitability and compliance to readiness fault detection and isolation capability specification requirements. This simulation effort will further provide for the development of analog circuitry SCT methods and techniques.

J. Major Contracts:

1. Contractor: TBD (Competitive) 35K

Contractor shall conduct a study to determine what common analog functions may be replaced by digital technology, and to determine the limits and constraints upon this replacement.

2. Contractor: TBD (Competitive) 90K

Contractor shall develop methods, techniques, and guidelines for the design of testable analog circuitry. This work shall include guidelines for the incorporation of SCT into analog designs and shall provide techniques for verification of testability.

3. Contractor: TBD (Competitive) 200K

Contractor shall develop an analog circuit simulator capable of being used as a design and verification tool for the performance and testability of analog circuits. An existing analog simulator shall be used as the starting point for this effort. The simulator shall simulate active and passive analog elements, at the basic component level, the functional level, or combinations of both. It shall have outputs indicating the best test point nodes, and shall also have outputs indicating the overall testability of the device being simulated.

Section 1.0 - Technology Assessment

A. Airtask No.:

B. NAVAIRSYSCOM Activity: AIR-340E

C. Task Title: Basic Elements, Digital Hardware Testability

D. Task No.: 1.1.2

E. Task Classification: Unclassified

F. Funding Category:

G. Funding Requirements:

FY-76	FY-7T	FY-77	FY-78	FY-79	FY-80
100K	25K	76K	0	0	0

H. Field Activity:
Principal Investigator:
Associate Investigator:

I. Summary:

This task is to increase the testability of digital avionics hardware and several efforts will be performed to complete the task.

Techniques for the design and testing of digital circuitry will be investigated to provide a basis for improvement of presently applied methods. A guide for design for testability will be developed. Considerations for implementing microprogramming and BIT techniques in new designs will also be made during this effort.

A survey of available digital devices will be conducted to determine parameter limitations, ranges, etc., that are required in the design criteria of circuitry and automated test generation.

A survey of available digital simulator programs will be done to provide a means of evaluating performance and supportability parameters of new digital equipment designs.

J. Major Contracts: None

Section 1.0 - Technology Assessment

A. Airtask No.:

B. NAVAIRSYSCOM Activity: AIR-340E

C. Task Title: Basic Elements, Software

D. Task No.: 1.1.3

E. Task Classification: Unclassified

F. Funding Category:

G. Funding Requirements:

FY-76	FY-7T	FY-77	FY-78	FY-79	FY-80
106K	0	0	0	0	0

G. Field Activity:
Principal Investigator:
Associate Investigator:

I. Summary:

This task is to improve the capabilities for cost effective generation and verification of software related to avionics, and to investigate and develop criteria for software generation and verification which will reflect the rapidly expanding requirements for design and support of new avionics systems.

Software aids used for automation of design and fabrication will be evaluated and new concepts and criteria developed which will reflect the needs for integration of design, fabrication, and test requirements of new avionic equipment. These concepts and criteria will be applied to the analog and digital simulator developments of Section 1.1.

The investigation and development of a very high speed, fully automated analog and digital simulation and test generation facility will be pursued. It will be capable of utilization as an evaluator of new design characteristics and supportability factors as well.

J. Major Contracts:

1. Contractor: TBD 80K

Contractor will survey existing software tools used for automation of design and fabrication, develop concepts and criteria for software development which will increase effectiveness and simplify the task of verification, and recommend any new software capabilities necessary for the production of cost effective software for avionic applications.

Section 1.0 - Technology Assessment

A. Airtask No.:

B. NAVAIRSYSCOM Activity:

C. Task Title: Packaging Concept for MSI/LSI Avionics

D. Task No.: 1.1.4

E. Task Classification: Unclassified

F. Funding Category: 6.2

G. Funding Requirements:

FY-76	FY-7T	FY-77	FY-78	FY-79	FY-80
221K	51K	129K	0	0	0

H. Field Activity:
Principal Investigator:
Associate Investigator:

I. Summary:

Packaging technologies for the 1980's will be investigated, and readiness parameters will be defined and quantized. The impact of LSI on both module and black box packaging will be the primary area of investigation. The feasibility of functional specifications for packaging will be determined, and guidelines will be developed for the design of an adequate and will defined readiness capability for all levels of packaging. An intensive effort will be made in the connector area to improve both reliability and cost of connectors. This effort will coordinate with, evaluate and provide readiness inputs to the several standard packaging concepts now being developed both by the military and by the commercial airlines.

This task shall result in recommendations for a feasible and cost effective packaging philosophy that will improve the readiness factors of avionics using MSI/LSI electronic circuitry.

J. Major Contracts:

1. Contractor: TBD 25K

Manufacturer shall investigate packaging requirements for the 1980-2000 era using MSI/LSI electronic circuitry. Avionics Readiness parameters shall be defined and quantized for such packaged and measurement techniques developed for these parameters. The feasibility of functional packaging with prespecified readiness and support interface requirements shall be investigated.

2. Contractor: TBD 75K

The contractor will develop methods, techniques and constraints for the design and fabrication of functional packages having good readiness parameters, including self-contained test, reliability, maintainability, testability, minimal logistics support. etc.

3. Contractor: TBD 40K

Investigate and evaluate state-of-the-art interconnection techniques throughout all levels of avionics packaging and provide recommendations for the type of connectors/connection devices that will be available throughout the 1980's and will provide improved cost and reliability over present connector technology.

Section 1.0 - Technology Assesment

A. Airtask No.:

B. NAVAIRSYSCOM Activity: AIR-340E

C. Task Title: Development of Test/Repair Philosophy for Future Applications

D. Task No.: 1.2

E. Task Classification: Unclassified

F. Funding Category: 6.2

G. Funding Requirements:

FY-76	FY-7T	FY-77	FY-78	FY-79	FY-80
37K	18K	19K	0	0	0

H. Field Activity:

Principal Investigator:

Associate Investigator:

I. Summary:

The objective of this task is to develop a test/repair philosophy which can best support advanced technology. Investigations will conducted to determine the level of effort and skill required to achieve SRA repair, the necessity of repair, and the self test capability versus external test requirements. This investigation will depend on inputs from hardware/software efforts proposed in the technology assessment effort.

Throughout this study, emphasis must be placed on what technology is likely to produce in the time period considered. Consequently, a periodic review and update of this task is envisioned. The results will impact on the general maintenance concepts of future procurement of avionics systems.

J. Major Contracts:

1. Contractor: TBD (Competitive) 30K

Study of the Impact of Technology on Navy's Maintenance Concept in the 1980-2000 time period.

Section 1.0 - Technology Assessment

A. Airtask No.:

B. NAVAIRSYSCOM Activity: AIR-340E

C. Task Title: Technology Projection Summary

D. Task No.: 1.3

E. Task Classification: Unclassified

F. Funding Category: 6.2

G. Funding Requirements:

FY-76	FY-7T	FY-77	FY-78	FY-79	FY-80
117K	0	0	5.0	15.0	5.0

H. Field Activity:
Principal Investigator:
Associate Investigator:

I. Summary:

It is necessary to develop a technology data base upon which to rest predictions, estimates, and actions proposed by the ARP. Accordingly, this task considers the technologies likely to be readily available in the 1980-2000 time frame, and will estimate for each technology considered, those characteristics of interest to the ARP, such as reliability, production methods, cost trends, potential support problems, etc.

J. Major Contracts: None

Section 1.0 - Technology Assessment

A. Airtask No.:

B. NAVAIRSYSCOM Activity: AIR-340E

C. Task Title: Manufacturing and Sources for Future Technology

D. Task No.: 1.4

E. Task Classification: Unclassified

F. Funding Category: 6.2

G. Funding Requirements:

FY-76	FY-7T	FY-77	FY-78	FY-79	FY-80
106K	0	0	0	0	0

H. Field Activity:
Principal Investigator:
Associate Investigator:

I. Summary:

In the future, it appears that technology and design advances in electronic circuitry will be driven by consumer, rather than military applications. It is necessary, therefore, for the military avionics community to investigate this trend and develop methods to use it to advantage or, failing that, to learn to live with it in as cost-effective a manner as possible. This task is an investigation of present design and production trends in large volume consumer electronic components and products. The output of the task will be recommendations of various methods to use these trends effectively, and (application dependent) decision criteria for choice among them. The decision criteria will be suitable for use in a Life Cycle Cost model.

In addition, present environmental specifications will be evaluated with respect to:

1. The expected parameters of future avionics technology as developed in Task No. 1.2.1 (Technology Projection Summary).

2. The feasibility of using commercial grade components in future military avionics.

J. Major Contracts:

1. Contractor: TBD 50K

Contractor will investigate design and production trends in commercial electronic circuit technology and evaluate and report on the impact of military avionics.

Contractor will develop recommended methods for the military to use these trends effectively, and decision criteria will be developed for the choice among these recommendations for a particular application. For example. the feasibility and decision criteria for the choice of using commercial electronics, or funding the manufacturer to incorporate military requirements into commercial electronics, or developing a government owned production facility, will be investigated.

2. Contractor: TBD 30K

Contractor will investigate present environmental specifications for avionics and avionic support equipment in order to determine their applicability to the projected technologies of 1980-2000, and to determine avionic and avionic support applications in which commercial electronics of the 1980-2000 era could be used. The resuts of task 1.2.1 shall be used in this effort.

SECTION 2.0

TECHNOLOGY APPLICATION

Section 2.0 - Technology Application

A. Airtask No.:

B. NAVAIRSYSCOM Activity: AIR-340E

C. Task Title: Aircraft Systems Test

D. Task No.: 2.1

E. Task Classification: Unclassified

F. Funding Category: 6.2

G. Funding Requirements:

FY-76	FY-7T	FY-77	FY-78	FY-79	FY-80
25K	37.5K	113.0K	12K	0	0

H. Field Activity:
Principal Investigator:
Associate Investigator:

I. Summary:

The objective of this task is to develop methods and procedures to coordinate, consolidate, and render more effective the various types of aircraft tests performed at the organizational level. Initially, a realistic relationship between mission acceptable limits of operation and specification limits of operation for typical aircraft subsystems will be established. This will result in a definition of limits suitable for pre-mission aircraft checkout. The capability of SCT to accurately measure and correlate these limits will be investigated and suitable recommendations made. The feasibility and/or availability of functional test modules for avionics equipment (i.e., a test generation and measurement SRA) will be investigated and requirements for such modules developed.

Methods will be developed whereby readiness testing can be merged with or otherwise interface efficiently with diagnostic testing at all levels of maintenance.

Guidelines and standards will be developed which will provide the most cost effective test and repair capability at all maintenance levels.

J. Major Contracts:

1. Contractor (Competitive) 50K

Contractor shall develop guidelines and specifications to provide the most cost effective test and repair capability at the organizational level. Guidelines shall include types and extent of readiness, diagnostic, and specification tests to be performed, the frequency of test, the limits on support equipment, time allowed for test, SCT considerations, test verification techniques, etc.

2. Contractor (Competitive) 70K

Contractor shall develop methods to assure continuity of test between the organizational level of test and all higher levels of maintenance. Test software interface specifications shall be developed such that readiness test software can be transferred to other levels with minimum cost and risk, and that available SCT shall be fully utilized at all levels of maintenance.

Section 2.0 - Technology Application

A. Airtask No.:

B. NAVAIRSYSCOM Activity: AIR-340E

C. Task Title: SCT Versus Shop Test

D. Task No.: 2.2

E. Task Classification: Unclassified

F. Funding Category: 6.2

G. Funding Requirements:

FY-76	FY-7T	FY-77	FY-78	FY-79	FY-80
25K	25K	150K	12.5K	0	0

H. Field Activity:
Principal Investigator:
Associate Investigator:

I. Summary:

The results of this task will identify those system or unit types which cannot be adequately tested in the aircraft, and further, it will identify shop test requirements necessary for total system support.

J. Major Contracts: TBD 100K

The contractor shall provide specific analytical data and assist in tradeoff analysis study (two year effort).

Section 2.0 - Technology Application

A. Airtask No.:

B. NAVAIRSYSCOM Activity: AIR-340E

C. Task Title: SCT/Reliability Considerations

D. Task No.: 2.3

E. Task Classification: Unclassified

F. Funding Category: 6.2

G. Funding Requirements:

FY-76	FY-7T	FY-77	FY-78	FY-79	FY-80
175K	37.5K	25K	0	0	0

H. Field Activity:
Principal Investigator:
Associate Investigator:

I. Summary:

This task will ascertain the effect of SCT design on reliability for typical avionics technologies and selected avionics functions. Currently BIT or BITE is designed and implemented by groups of engineers totally separated from the principal design team. This approach adds on to the units complexity and degrades reliability. This task will explore the reliability/cost trades involved in requiring SCT to be designed and implemented as an integral part of the system, rather than as an add on.

As supporting efforts, the technologies and avionic subsystem functions most amenable to SCT inclusion will be identified, and the feasibility of developing a mathematical tool (similar to Boolean Algebra) for the design and verification of SCT inclusion in digital circuitry will be investigated.

J. Major Contracts:

1. Contractor (Competitive) 50K

Contractor will determine which avionic subsystem functions are most amendable to verification using SCT, and will use the results of Section 1.2 (Technology Projection Summary) to determine those technologies most suitable for incorporation of SCT.

2. Contractor: TBD 25K

Contractor will determine the feasibility of developing a mathematical tool enabling both the incorporation of SCT into digital design with minimum impact on reliability (i.e., minimize components), and the verification of the performance and reliability of the circuit. The mathematical approach will be verified on the design results of Section 1.1.

Section 2.0 - Technology Application

A. Airtask No.:

B. NAVAIRSYSCOM Activity: AIR-340E

C. Task Title: Shop Tester Requirements

D. Task No.: 2.4

E. Task Classification: Unclassified

F. Funding Category: 6.2

G. Funding Requirements:

FY-76	FY-7T	FY-77	FY-78	FY-79	FY-80
0	50K	87.5K	50K	12.5K	0

H. Field Activity:
Principal Investigator:
Associate Investigator:

I. Summary:

Next generation shop tester requirements shall be established based upon candidate equipment, present and projected scope of capability, and future testing technology.

J. Major Contracts: TBD 50K

The contractor shall perform studies of existing third generation test technologies and further research ATE technological advances to establish fourth generation ATE potential.

SECTION 3.0

SYSTEMS TRADEOFF AND DESIGN

Section 3.0 - System Tradeoff and Design

A. Airtask No.:

B. NAVAIRSYSCOM Activity: AIR-340E

C. Task Title: Human Factors in Avionics Readiness

D. Task No.: 3.1

E. Task Classification: Unclassified

F. Funding Category: 6.2

G. Funding Requirements:

FY-76	FY-7T	FY-77	FY-78	FY-79	FY-80
12.0K	3.0K	12.0K	12.0K	12.0K	9.0K

H. Field Activity:
Principal Investigator:
Associate Investigator:

I. Summary:

Under this task senior investigators will insure that:

1. Human factors tasks are responsive to innovations introduced by other ARP tasks.

2. Will, to the maximum extent, use ARP as a focal point of application for research efforts sponsored by ONR and other DOD components.

Through AIR-340F, the Human Engineering Division of ONR has agreed to appoint the principal investigator of this task as a monitor of ONR programs sponsored in maintainability. LCDR Theisen serves as consultant to the Navy Technical Manual System project sponsored by AIR-340 and to the ASD I & L and Army program to make technician training and manuals more job oriented.

J. Major Contracts: None

Section 3.0 - System Tradeoff and Design

A. Airtask No.:

B. NAVAIRSYSCOM Activity: AIR-340E

C. Task Title: Human Factors in Avionics Readiness; Equipment Design Factors

D. Task No.: 3.1.1

E. Task Classification: Unclassified

F. Funding Category: 6.2

G. Funding Requirements:

FY-76	FY-7T	FY-77	FY-78	FY-79	FY-80
0	7.0K	21.0K	12.5K	50.5K	39.5K

H. Field Activity:

Principal Investigator:

Associate Investigator:

I. Summary:

The focus of this task will be the maintainer on-the-job. His functions and roles in ARP projected 1985-2000 avionics will be defined and analyzed. Using data from tasks 3.1.2 and 3.1.3 and other sources, guidelines will be developed for making these defined functions and roles: faster, more accurate and simpler/more effective.

While planned ARP funding will only provide a portion of required funding of this task, ARP will serve as a focus for the application of results from separately funded Human Factors tasks. For many years complaints have been made regarding the failure of "design-for-maintainability" efforts. The guide to be developed in this task will provide a major step forward assisting engineers in a practical way.

J. Major Contracts: TBD

Section 3.0 - System Tradeoff and Design

A. Airtask No.:

B. NAVAIRSYSCOM Activity: AIR-340E

C. Task Title: Human Factors: Support Factors in Maintainability

D. Task No.: 3.1.2

E. Task Classification: Unclassified

F. Funding Category: 6.2

G. Funding Requirements:

FY-76	FY-7T	FY-77	FY-78	FY-79	FY-80
52.0K	13.0K	64.0K	52.0K	34.0K	0

H. Field Activity:

Principal Investigator:
Associate Investigator:

I. Summary:

This Task Plan addresses the following areas:

(i) Technical Manuals
(ii) Training
(iii) Test Equipment
(iv) Supply Philosophy
(v) Performance Measurement

To get the full benefit of changes in engineering design, such as SCT, coordinated changes should be planned in the above elements. Pressure for these changes also comes from projected changes in the work force. This Task Plan will be coordinated with other ARP tasks and with ongoing work sponsored by other Navy and DOD programs such as the Navy Technical Manual System Program. This Task Plan will develop procedures and guidelines for achieving effective development of support elements during the design, development process. The identification and development of support elements must be given sufficient lead time to assure Fleet capability to maintain a new system when it is delivered to them.

The training system and technical manuals must be customized for a weapon system considering the planned test equipment and supply philosophy.

J. Major Contracts: TBD

Section 3.0 - System Tradeoff and Design

A. Airtask No. :

B. NAVAIRSYSCOM Activity: AIR-340E

C. Task Title: Human Factors; Organizational Factors in Maintainability

D. Task No: 3.1.3

E. Task Classification: Unclassified

F. Funding Category: 6.2

G. Funding Requirements:

FY-76	FY-7T	FY-77	FY-78	FY-79	FY-80
54.0K	13.0K	39.0K	0	0	0

H. Field Activity:

Principal Investigator:

Associate Investigator:

I. Summary:

Future Navy technicians will be selected from a wider range of SCT scores than the exclusively high level technicians of the past. In addition, the future first tour technicians will recieve only short job-oriented training and little theoretical training. This task plan will deal withchanges in the maintenance work centers and other organizational components which must accompany the forecast changes in selection and training. During their first tour they will be able to perform checkout, limited (guided) troubleshooting, some alignment adjustment, and replacement repairs. They will be learning on the job both by doing the job and by studying prepared training materials. They will be supported on the job by improved Self Contained Test, Auto Test Equipment, and Maintenance Aids. Suggested changes will be coordinated with all Navy agencies involved in their implementation.

J. Major Contracts: None

Section 3.0 - System Tradeoff and Design

A. Airtask No.:

B. NAVAIRSYSCOM Activity: AIR-340E

C. Task Title: Avionics Testing

D. Task No.: 3.2

E. Task Classification: Unclassified

F. Funding Category: 6.2

G. Funding Requirements:

FY-76	FY-7T	FY-77	FY-78	FY-79	FY-80
78.8K	25.9K	103.9K	95.9K	59.0K	21.5K

H. Field Activity:

Principal Investigator:

Associate Investigator:

I. Summary:

It is necessary to develop an integrated systems test plan mhich ensures effective testing at all maintenance levels, reduces support personnel and associated skill requirements, and provides useful integrated test design documentation early in the prorgam for use by all test development organizations.

This task addresses the development of test design which includes tolerance cones, detailed avionics test techniques for commonly used circuitry, and a detailed avionics test matrix for support planning. The initial objective will be to develop data standards from current test methodologies, automatic test equipment programs, and through application of the principles and specifications developed io other tasks

J. Major Contracts: TBD

Section 3.0 - System Tradeoff and Design

A. Airtask No.:

B. NAVAIRSYSCOM Activity: AIR-340E

C. Task Title: Weapons System Support

D. Task No.: 3.3

E. Task Classification: Unclassified

F. Funding Category: 6.2

G. Funding Requirements:

FY-76	FY-7T	FY-77	FY-78	FY-79	FY-80
0	0	32.7K	122.8K	6.2K	0

H. Field Activity:

Principal Investigator:

Associate Investigator:

I. Summary:

It is necessary to develop support matrices which will identify commonality of equipment parameters and characteristics to eliminate test redundancy and requirements for special support equipment and/or unique test program sets.

This task addresses the determination of the best test requirements methodology for each level of test, fault detection and isolation techniques, and standard software interfaces and routines.

J. Major Contracts: TBD

Section 3.0 - System Tradeoff and Design

A. Airtask No.:

B. NAVAIRSYSCOM Activity: AIR-340E

C. Task Title: Subsystem Implementation

D. Task No.: 3.4

E. Task Classification: Unclassified

F. Funding Category: 6.2

G. Funding Requirements:

FY-76	FY-7T	FY-77	FY-78	FY-79	FY-80
0	20.0K	72.0K	67.0K	72.0K	37.0K

H. Field Activity:

Principal Investigator:

Associate Investigator:

I. Summary:

In order to prove methodology developed for the Avionics Readiness Program to be applied in the 1980-2000 time frame, a prototypeprogram is needed. A selection procedure is to be utilized to establish candidate substems that have characteristics which are consistent with the technologies and procedures to be proven.

After selection, an integrated subsystem development and readiness plan is to be generated. Implementation of the plan will produce an engineering development model equipment which reflects readiness factors in both design and support functions.

Monitoring of thse activities will provide valuable feedback to the overall readiness discipline. The monitoring will continue through Fleet introduction to provide concrete proof of the readiness concept.

J. Major Contracts: TBD

Section 3.0 - System Tradeoff and Design

A. Airtask No.:

B. NAVAIRSYSCOM Activity: AIR-340E

C. Task Title: Weapon System Design and Implementation

D. Task No.: 3.5

E. Task Classification: Unclassified

F. Funding Category: 6.2

G. Funding Requirements:

FY-76	FY-7T	FY-77	FY-78	FY-79	FY-80
55.5K	20.0K	83.9K	96.6K	58.2K	0

H. Field Activity:
Principal Investigator:
Associate Investigator:

I. Summary:

The Systems Design effort will select an advanced Navy Weapon System as a model and will work with the weapon system design team to develop and apply improved readiness techniques. The results of other task areas will be applied, including a system maintenance philosophy, on-board test, special test, and repair methods. A complete support system and all maintenance levels will also be designed.

The efforts will seek a best solution for, and combination of, performance and support within cost constraints or design to cost goals.

J. Major Contracts:

There are no major contracts planned for this weapon system design application task.

SECTION 4.0

SPECIFICATIONS AND PROCUREMENT

Section 4.0 - Specification and Procurement

A. Airtask No.:

B. NAVAIRSYSCOM Activity: AIR-340E

C. Task Title: Specification for Procurement of Advanced Avionics Equipment/Weapons Systems

D. Task No.: 4.1

E. Task Classification: Unclassified

F. Funding Category: 6.2

G. Funding Requirements:

FY-76	FY-7T	FY-77	FY-78	FY-79	FY-80
48.8K	29.0K	137.5K	200.0K	200.0K	109.5K

H. Field Activity:
Principal Investigator:
Associate Investigator:

I. Summary:

As the principle "deliverables" of the Advanced Readiness Program, specifications for procurement of the new generation avionics will be prepared. The efforts require investigation of the current specification hierarchy for readiness applicability and content, and the establishment of readiness requirements consistent with the new generation technologies and operational planning. Quantitative foundations for acceptance and assurance testing relating to the support and readiness capability of advanced avionics equipment and systems will be consolidated with the essential requirements within an advanced avionics equipment specification for future procurements. Specifications so prepared shall undergo review by all affected naval activities, avionics manufacturers, weapons sytem contractors and others having specific interest in this area. Provision is made for incorporation of comments and recommendations forthcoming, and submittal for Navy approvals.

J. Major Contracts: TBD

Section 4.0 - Specification and Procurement

A. Airtask No.:

B. NAVAIRSYSCOM Activity: AIR-340E

C. Task Title: Pre-Acceptance Test and Demonstration of Readiness Requirements

D. Task No.: 4.2

E. Task Classification: Unclassified

F. Funding Category: 6.2

G. Funding Requirements:

FY-76	FY-7T	FY-77	FY-78	FY-79	FY-80
72.75K	29.50K	92.14K	70.16K	51.77K	23.98K

H. Field Activity:

Principal Investigator:

Associate Investigator:

I. Summary:

The provisions for pre-acceptance demonstration and test for compliance with essential readiness design characteristics of advanced avionics equipment are to be established by this task. Initially, an investigation of the readiness assurance provisions currently specified, referenced or recommended in specification, standards, etc., will be conducted. Determination of the adequacy or deficiency of the present methods in measuring the readiness design characteristics of the avionics and their relationship to costs, risks and validity/reliability of the tests are made. Where deficiencies are disclosed, alternative methods are investigated and developed for application as candidate advanced avionics pre-acceptance test and demonstration requirements. Using the readiness design requirements for Advanced Avionics Equipment developed under a related task (1.1) and in full consideration of the technological, design and testing projections separately produced under other task areas of this program, a program of pre-acceptance test and demonstration provisions is selected to optimize the readiness assurance of the new generation avionics.

J. Major Contracts: TBD

Section 4.0 - Specification and Procurement

A. Airtask No.:

B. NAVAIRSYSCOM Activity: AIR-340E

C. Task Title: Development of Warranty Requirements for Advanced Avionics Procurement

D. Task No.: 4.3

E. Task Classification: Unclassified

F. Funding Category: 6.2

G. Funding Requirements:

FY-76	FY-7T	FY-77	FY-78	FY-79	FY-80
60.3K	26.6K	72.8K	0	0	0

H. Field Activity:
Principal Investigator:
Associate Investigator:

I. Summary:

It is necessary to formulate an effective basis for selection of warranties for advanced avionics procurements. This task addresses this problem by examining existing warrantly contractual provisions for their impact on all aspects of procurement. From this point of departure, warranties will be analyzed for their impact on cost, avionics readiness, and interfacing requirements with other contractual provisions. Recommendations will be made to formulate warranty provisions for future avionics procurement.

J. Major Contracts: TBD

SECTION 5.0

COST MANAGEMENT

Section 5.0 - Cost Management

A. Airtask No.:

B. NAVAIRSYSCOM Activity: AIR-340E

C. Task Title: Improvement of Cost Credibility

D. Task No.: 5.1

E. Task Classification: Unclassified

F. Funding Category: 6.2

G. Funding Requirements:

FY-76	FY-7T	FY-77	FY-78	FY-79	FY-80
37.2K	14.1K	42.4K	35.6K	0	0

H. Field Activity:
Principal Investigator:
Associate Investigator:

I. Summary:

An increase in the confidence of tradeoff decisions for ARP (Avionics Readiness Program) areas such as Design-to-Cost and cost targeting, is required. The establishment of a cost profile structure, shown to be both viable and effective in applied cost analysis, will improve cost credibility.

This task calls for the analysis of three designated areas of Navy program planning and management that are particularly cost sensitive, namely budgetary management and constraints, program management policies in weapon system procurement, and the impact of program changes on LCC (Life Cycle Cost). The LCC data base, structured under a separate task plan will be utilized to demonstrate its suitability as the ARP cost profile structure.

J. Major Contracts: TBD

Section 5.0 - Cost Management

A. Airtask No.:

B. NAVAIRSYSCOM Activity: AIR-340E

C. Task Title: Development of a Life Cycle Cost Data Base

D. Task No.: 5.1.1

E. Task Classification: Unclassified

F. Funding Category: 6.2

G. Funding Requirements:

FY-76	FY-7T	FY-77	FY-78	FY-79	FY-80
78.8K	11.0K	44.2K	0	0	0

H. Field Activity:
Principal Investigator:
Associate Investigator:

I. Summary:

The LCC (Life Cycle Cost) data base combines the SCDB (Support Cost Data Base) with related procurement cost data to provide an overall cost data base for use in weapon system cost effectiveness tradeoffs. A viable and effective LCC data base will impact significantly on the credibility of tradeoff decisions required by the ARP (Avionics Readiness Program).

This task comprises two subtasks, the first of which is to develop a procurement related data base which will complement the support cost data base being developed under a separate task plan. The second subtask integrates both data bases into an overall LCC data base.

J. Major Contracts: TBD

Section 5.0 - Cost Management

A. Airtask No.:

B. NAVAIRSYSCOM Activity: AIR-340E

C. Task Title: Development of Support Cost Data Base

D. Task No.: 5.1.2

E. Task Classification: Unclassified

F. Funding Category: 6.2

G. Funding Requirements:

FY-76	FY-7T	FY-77	FY-78	FY-79	FY-80
67.0K	7.2K	21.6K	0	0	0

H. Field Activity:

Principal Investigator:
Associate Investigator:

I. Summary:

It is necessary to establish credible LCC (Life Cycle Cost) data base to provide effective management tools for support of the ARP (Avionics Readiness Program). Emphasis is placed on support cost aspects of LCC because of their direct impact on avionic readiness, and the relative inadequacy of associated data. This is accomplished by individual treatment of support costs.

This task addresses the development of SCDB's (Support Cost Data Bases) only. The initial objective is to develop a SCDB for certain selected A/S (Avionic Subsystems), down to the lowest component level realistically obtainable, and which will have immediate utility. From this experience, it will be determined how to improve the SCDB to include additional A/S and enhanced data. The ultimate objective is to implement an improved SCDB which will meet the additional requirements of the ARP. The resulting SCDB's will form the nucleus for the LCC data bases.

J. Major Contracts: TBD

Section 5.0 - Cost Management

A. Airtask No.:

B. NAVAIRSYSCOM Activity: AIR-340E

C. Task Title: Development of Cost Targeting Procedures

D. Task No.: 5.2

E. Task Classification: Unclassified

F. Funding Category: 6.2

G. Funding Requirements:

FY-76	FY-7T	FY-77	FY-78	FY-79	FY-80
0	26.0K	84.0K	58.0K	0	0

H. Field Activity:
Principal Investigator:
Associate Investigator:

I. Summary:

Design-to-Cost procurement policies have generated the need to establish LCC (Life Cycle Cost) targets for major elements of the system to be developed. Procedures for targeting the costs of such elements will be developed under this task.

Existing philosophies and studies will be evaluated to identify areas where effort is needed. Contractual incentive methods directed toward meeting pre-established support cost targets will be developed. Methodology for correlating LCC targets in areas of Procurement and Operation will be determined for the support of related ARP (Avionics Readiness Program) efforts. A management plan, emphasizing support cost aspects, is to be developed for LCC target allocation.

J. Major Contracts: TBD

Section 5.0 - Cost Management

A. Airtask No.:

B. NAVAIRSYSCOM Activity: AIR-340E

C. Task Title: Development and Application of Cost Estimating Methodology

D. Task No.: 5.3

E. Task Classification: Unclassified

F. Funding Category: 6.2

G. Funding Requirements:

FY-76	FY-7T	FY-77	FY-78	FY-79	FY-80
13.2K	14.0K	63.6K	79.9K	60.4K	18.9K

H. Field Activity:

Principal Investigator:
Associate Investigator:

I. Summary:

The numerous LCC (Life Cycle Cost) implications of the ARP (Avionics Readiness Program) call for detailed cost estimates to be made in an accurate and timely manner. The current state-of-the-art of cost estimating, particularly in the areas of support of avionic equipment, is in need of improvement.

This task will develop the methodology needed to provide the Navy with the capability of generating LCC estimates needed in the management of avionic equipment development programs being considered by the ARP. Existing capabilities will be studied to identify areas of deficiency and to prioritize these areas in terms of LCC impact. The cost profile structure developed and evaluated under separate task plans will identify the cost elements and provide the associated cost data for the avionic subsystems of interest.

J. Major Contracts: TBD

Section 5.0 - Cost Management

A. Airtask No.:

B. NAVAIRSYSCOM Activity: AIR-340E

C. Task Title: Investigation of Shifting Cost Centers

D. Task No.: 5.4

E. Task Classification: Unclassified

F. Funding Category: 6.2

G. Funding Requirements:

FY-76	FY-7T	FY-77	FY-78	FY-79	FY-80
13.2K	38.3K	56.0K	28.6K	0	0

H. Field Activity:
Principal Investigator:
Associate Investigator:

I. Summary:

Cost centers, accountable at gross budget category levels and at detailed subdivisions of the contract Work Breakdown Structure, are subject to changes in expenditure ratios such as those due to technology changes. Unanticipated shifts in relative expenditures for these cost centers can introduce serious problems in the management of system programs as well as reducing system readiness and capability. A determination of the historical ratios for applicable cost centers and projections of corresponding shifts, based on ARP (Avionics Readiness Program) advanced technology information, will be accomplished in this task. Interfaces of Design-to-Cost and cost targeting based on analyses of shifting cost centers will be investigated.

J. Major Contracts: TBD

Section 5.0 - Cost Management

A. Airtask No.:

B. NAVAIRSYSCOM Activity: AIR-340E

C. Task Title: Development and Application of Cost Indices

D. Task No.: 5.5

E. Task Classification: Unclassified

F. Funding Category: 6.2

G. Funding Requirements:

FY-76	FY-7T	FY-77	FY-78	FY-79	FY-80
39.0K	20.0K	66.5K	46.5K	34.8K	0

H. Field Activity:
Principal Investigator
Associate Investigator:

I. Summary:

In the projection of LCC (Life Cycle Cost) for avionics and avionics support systems to be procured in the 1980-2000 time frame, it is recognized that changes in design and production methods due to advanced technological applications may call for adjustments to CER's (Cost Estimating Relationships) based on current technology. Cost/Technology Indices provide this means of adjusting LCC projections in response to anticipated technology changes. This task provides for the development and application of those indices that would be expected to have the greatest impact on the related cost projection requirements of the ARP (Avionics Readiness Program). Tracking and validation of all such indices will be initiated to permit needed refinement.

J. Major Contracts: TBD

SECTION 6.0

READINESS GOALS AND MEASURES

Section 6.0 - Readiness Goals and Measures

A. Airtask No.

B. NAVAIRSYSCOM Activity: AIR-340E

C. Task Title: ARP Definition

D. Task No.: 6.1

E. Task Classification: Unclassified

F. Funding Category: 6.2

G. Funding Requirements:

FY-76	FY-7T	FY-77	FY-78	FY-79	FY-80
107.0K	36.0K	43.0K	25.0K	25.0K	25.0K

H. Field Activity:

Principal Investigator:
Associate Investigator:

I. Summary:

This task will define and validate Readiness factors and provide direction for a comprehensive Avionics Readiness Program for the 1980 to 2000 time frame. These definitions must be projected for all levels of development, acquisition, operation and support so that guidance is available for weapons systems planning, evaluation and Readiness improvement.

This task develops a set of evaluation criteria reflecting all factors associated with Readiness and the efficiency of the various functional activities associated with it. Definitions with respect to other disciplines are refined. Methods of Information Collection and impact on existing functions will be considered. A simulation of a process for Readiness will be developed along with a systematic, computer oriented accounting system. The final result will be an operating system which will effectively establish Readiness Measures and Goals in such a manner as to provide a capability to Design and Plan for Readiness.

J. Major Contracts: None

Section 6.0 - Readiness Goals and Measures

A. Airtask No.:

B. NAVAIRSYSCOM Activity: AIR-340E

C. Task Title: Parameterization and Quantification of Readiness Factors

D. Task No.: 6.2

E. Task Classification: Unclassified

F. Funding Category: 6.2

G. Funding Requirements:

FY-76	FY-7T	FY-77	FY-78	FY-79	FY-80
81.0K	54.5K	162.5K	61.0K	43.0K	0

H. Field Activity:

Principal Investigator:
Associate Investigator:

I. Summary:

The purpose of the parametrization and quantification effort is to develop and evaluate a set of readiness related parameters for 1980-2000 avionics systems and the mathematical models which relate these parameters to readiness. The Readiness related parameters will describe the basic RMS (Reliability, Maintainability, Supportability) properties of all hardware/software/support system elements in the avionics system as well as the protection against environmental hazards to ensure the integrity of RMS parameters in the transition from the laboratory to the field. During the engineering design process, the models will enable the RMS of either an ADM or EDM to be projected based on measurement of the RMS related parameters. The initial set of models is expected to be available 1.5 to 2 years after project startup. As these tools are applied on future avionics procurements, the parameterization and quantification task will evaluate their effectiveness and perform any updates/refinements which may be required.

J. Major Contracts: None